IN THE UNITED STATES DISTRICT COURT FOR THE

NORTHERN DISTRICT OF OKLAHOMA

W. A. DREW EDMONDSON, in his capacity as ATTORNEY GENERAL OF THE STATE OF OKLAHOMA and OKLAHOMA SECRETARY OF THE ENVIRONMENT C. MILES TOLBERT, in his capacity as the TRUSTEE FOR NATURAL RESOURCES FOR THE STATE OF OKLAHOMA, Plaintiff,	)
vs.	) 4:05-CV-00329-TCK-SAJ
TYSON FOODS, INC., et al, Defendants.	)

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VOLUME I OF THE VIDEOTAPED

DEPOSITION OF INDRAJEET CHAUBEY, PhD, produced as a witness on behalf of the Plaintiff in the above styled and numbered cause, taken on the 27th day of January, 2009, in the City of Tulsa, County of Tulsa, State of Oklahoma, before me, Lisa A. Steinmeyer, a Certified Shorthand Reporter, duly certified under and by virtue of the laws of the State of Oklahoma.

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A No.
Q Have you performed any consulting work for the State of Oklahoma in the past?
A No.
Q Have you been retained to provide an opinion about the State of Oklahoma experts' opinions? 09:00AM
A No.
Q Have you been retained to consult with any of the State's experts on any issue in this case?
A No. 09:01AM
Q Have you been retained by anyone to provide opinions as to the defendants' experts' opinions?
A No.
Q Other than coming to testify today in Tulsa, have you been asked by me or others for the State of Oklahoma to do any work on this case? 09:01AM
A No.
Q Other than your coming today to testify, have you been asked by me or others for the State of Oklahoma to form any opinions specifically in connection with this case? 09:01AM
A No.
Q Let's talk a little bit about you, Dr. Chaubey. I'm going to hand you what is Exhibit No. 1. I'll represent to you that this is a document 09:02AM

that I downloaded from the Purdue University, which appears to be, at least in part, a curriculum vitae. Would you agree with that?

A Yes.

Q And is this -- is the data that's on this maintained by you or under your direction? 09:02AM

A Under my direction.

Q Okay. Is the -- let's talk a little bit about -- first off, do you believe this is a full and complete curriculum vitae for you? 09:02AM

A This is not complete particularly. It only partially presents my work.

Q I'm going to ask some questions to give you an opportunity to kind of supplement some of the things on this. All right? 09:02AM

A Okay.

Q Let's start first with your degrees. You have the degrees listed here, and I'm going to take them in reverse order. Tell the court and the witnesses here, what is your bachelors of science degree in? 09:03AM

A My bachelors of science degree is in agricultural engineering.

Q And when did you obtain that degree?

A In 1991.

Q And at what university did you obtain that? 09:03AM

A It was from University of Allahabad in India.
Q Now, you've obtained a masters degree also. It's in biological and agricultural engineering. Where did you obtain that?
A At University of Arkansas. 09:03AM
Q And what year was that?
A 1994.
Q All right. Did you have a supervisor in your masters thesis work at that university?
A Yes. 09:03AM
Q Who was that?
A Dr. Dwayne Edwards.
Q Is he also known as D. R. Edwards?
A Yes.
Q All right. What was the thesis that you -- 09:04AM general subject matter of the thesis that you provided for your masters?
A I investigated how filter strips or buffer strips can be used as a best management practice to filter some of the water quality constituents from 09:04AM land-applied poultry litter and swine manure.
Q All right. You then obtained a PhD. Where was that obtained?
A Oklahoma State University.
Q And what was the degree obtained there? 09:04AM

A Biosystems engineering.
Q And what year was that degree obtained?
A 1997.
Q Did you have a thesis captain or director in your work there? 09:04AM
A Yes.
Q Who was that?
A It was Dr. C. T. Hahn.
Q What was the general subject of the thesis that you prepared for your doctorate? 09:05AM
A It was in the area of hydrology and watershed modeling. I investigated how different uncertainties relate to model inputs and parameters.
Q Okay. Let's talk a little bit about the awards and honors you have listed here. There are several, but are these all of the ones that you have obtained? 09:05AM
A No. Actually, what I consider the most significant is not listed here.
Q What is the award or honor that is significant to you that's not listed? 09:05AM
A It is New Holland Young Researcher Award. It is given by American Society of Agricultural and Biological Engineering to one researcher every year younger than 40 years old. 09:05AM

Q So what was the year of that?
A It was 2007.
Q And what is your age today?
A 40.
Q 40. Are there any other awards or honors you wish to list that aren't otherwise listed on Exhibit 1? 09:06AM
A No. The rest are.
Q Let's talk a little bit about your professional experiences. Other than those listed on this curriculum vitae, are there some omitted? Let me rephrase that. Are there other professional experiences that you think should be added to this that were not on it at the time this was prepared? 09:06AM
A I am involved in some committees and assignments at Purdue which are not listed here. For example, I am on a steering committee of ecological sciences and engineering, and I am a founding member of equivalent to board of directors on division of environmental and ecological engineering at Purdue. 09:06AM 09:07AM
Q All right. Are there any others?
A No. Rest of the significant ones are listed here.
Q All right. This particular document doesn't 09:07AM

have a listing for professional associations. Can you tell the court and jury what those may be?

A I am a member of American Society of Agricultural and Biological Engineering. I am also a member of American Water Resources Association, and two honor societies. One is Gamma Sigma Delta. It's honor society in agriculture, and second one is Alpha Epsilon, honor society in agricultural and biological engineering. 09:07AM

Q Are there any others that you can think of that you would wish to list today that aren't on this Exhibit 1? 09:07AM

A Not really.

Q All right. Exhibit 1 does not list all of your publications, does it? 09:08AM

A No, it does not.

Q All right. Let me hand you what's marked as Exhibit No. 2, and I would represent to you this is another download that I obtained from the website there at Purdue. Can you identify this document for the court, please? 09:08AM

A Yes. It is from my website. It is a list of my publications, presentations, seminars, research reports and other similar documents.

Q In looking at this list yesterday, did you 09:08AM

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determine whether it was complete or not?
A It is not most up to date. It says that I have 39 refereed journal articles. Since then that number has increased to 43.
Q Let me hand you what I'm going to mark as Exhibit 2A. Tell the court what that is. 09:09AM
A It comes from my letter CV. It is a list of -- first page of my list of publications, and it has got three additional refereed journal articles which are not on the website. 09:09AM
Q Did you provide that document to me yesterday?
A I gave that to you yesterday.
Q All right. Are there any other publications you may be currently working on that also are not on this list? 09:09AM
A Yes. There are a number of publications which are currently in progress.
Q Generally what is the scope or nature of those and the subject matter that might be being investigated? 09:10AM
A They all relate to non-point source pollution and hydrology in agricultural watersheds.
Q What watersheds do they relate to that you are doing this work in?
A A number of different watersheds. Some are 09:10AM

located in Arkansas; some are located in Indiana.
Q Are the ones in Arkansas connected to the or related to the Illinois River watershed?
A Yes.
Q Are you familiar with that watershed? 09:10AM
A I am.
Q Do you know the boundaries of it generally speaking?
A You mean boundaries of the Illinois River watershed? 09:10AM
Q Of the Illinois River watershed.
A I understand the boundaries of the Illinois River watershed.
Q Okay. Are there subwatersheds that you have also been working with within the Illinois River 09:10AM watershed?
A Yes.
Q What would that be?
A That will be Moores Creek, Lincoln Lake watershed, which is a small subwatershed within IRDA 09:11AM or Illinois River drainage area.
Q Okay. So I think I understand what you are saying. Is the area you are speaking to only in Arkansas and not Arkansas and Oklahoma?
A Yes. 09:11AM

Q All right. So the subwatershed, does it have a name?

A Moores Creek watershed. It is also at times referred as Lincoln Lake watershed.

Q All right. Has it ever been referred to as Muddy Fork; do you know? 09:11AM

A It is part of the Muddy Fork watershed, yes.

Q Okay. Let's talk a little bit about your employment history, if we can, sir. Starting with when you were still studying -- or tell me when was the first time that you took a paid position in or around your bachelors degree or after it, sometime in that starting time frame. 09:11AM

A So in 1992 in January I started my masters degree at the University of Arkansas, and I was a half-time research assistant, working 20 hours a week on a research project. 09:12AM

Q What was the nature of the project that you were working on there?

A I was involved in looking at land application of poultry litter and swine manure and how that results in water quality, constituent transport in small controlled plots, and what different best management practices could be considered to minimize that impact. 09:12AM 09:12AM

Q With regard to that work, did it include bacteria transport as part of those constituents?
A Yes, it did.
Q All right, and that period of time was from -- what were the dates of that work? 09:13AM
A So it went from January 1992 to July 1994.
Q Okay. Did you then obtain employment after that work in July of '94?
A I started my PhD in August of 1994 at Oklahoma State University, and I was a half-time research 09:13AM assistant there, working 20 hours a week.
Q What kind of work were you performing as a half-time research assistant?
A I was involved in looking at hydrologic and water quality models, how do they work in different 09:13AM watersheds, how we can improve them, how we can reduce their uncertainty.
Q Did you meet a gentleman by the name of Dr. Storm while at OSU?
A Dr. Daniel Storm, yes. 09:13AM
Q And did he participate in your PhD studies in any way?
A He was a member of my PhD committee.
Q After October '97, did you have additional employment? 09:14AM

A Yes.
Q Tell us what that was.
A I was assistant research scientist at University of Alabama from October 1997 until April 2000. 09:14AM
Q And what kind of work did you do as an assistant research scientist there?
A I worked as a hydrologist and water quality modeler, again, in general, looking at water response to runoff, sediment, nutrients. 09:14AM
Q Was that a full-time employment?
A That was a full-time employment.
Q After April 2000, did you secure employment elsewhere?
A I became assistant professor at University of Arkansas. 09:15AM
Q And what was the time frame that you were at University of Arkansas?
A So from May 2000 until December 2006 I was there. 09:15AM
Q All right, and did your position as an assistant professor change at any time during that period?
A In 2005 I became -- I got tenured and I was promoted to associate professor. 09:15AM

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Q All right. Where did you go after leaving University of Arkansas in December of '06?

A So in January of 2007 I became associate professor at Purdue University.

Q And were you hired there as a tenured professor? 09:15AM

A No, I was not hired there as a tenured professor. I got tenure last year.

Q You mentioned that you had done some work in the watershed of Indiana and then you've talked about the Illinois River watershed. Are there any other watersheds that you've had experience with besides those two? I say two. Let me back up. How many Indiana watersheds have you been involved with in doing your work or study? 09:16AM

A At least half a dozen of Indiana watersheds I'm working on right now.

Q Other than the Illinois River watershed, are there others in Arkansas that you've done work in?

A I've worked in Beaver Lake watershed. I was involved in Eucha-Spavinaw watershed and a number of what I call priority watersheds in Arkansas. 09:16AM

Q What kind of watersheds?

A Priority watersheds.

Q Priority watersheds, okay. Just briefly tell 09:17AM

the court, if you would, what kind of areas of study or investigation you were conducting in these various watersheds; are they consistent with what you've done in your degrees?

A Yes. They are all related to agricultural watersheds and looking at different processes related to hydrology and water quality, how do these processes affect what gets transported from these watersheds, how we can mathematically model them and what kind of different management practices we can evaluate to see what happens. 09:17AM 09:17AM

Q All right. How long now have you then -- I want to speak now basically about the Illinois River watershed or its subbasins. How long have you been directly involved in studying or investigating that watershed or its subbasins? 09:18AM

A My masters thesis was based on work in the Illinois River watershed, and then when I came back as a faculty in 2000, since then I have been involved in a number of projects in the watershed. 09:18AM

Q All right. So some of that work was in the early '90's and then again starting in around 2000?

A Yes.

Q All right. Did your work in the watershed include what I called field work study? 09:18AM

A Poultry litter indicates a combination of poultry manure and bedding material that is in poultry houses, what comes out after cleaning.

Q All right. So if I use the term poultry waste, do you understand that it's similarly as you've defined poultry litter? 09:30AM

MS. LONGWELL: Object to form.

A Yes.

Q Okay. Based upon your experience, knowledge, review of published literature, do you have an opinion of how far from the poultry barn the poultry waste is usually taken to be land applied? 09:31AM

MR. GEORGE: Object to the form. Rick, I want to elaborate for a moment on my objection. It's apparent to me that the plaintiffs are now trying to solicit opinions from Dr. Chaubey beyond those that he has previously expressed in any literature, and by virtue of that, are trying to turn Dr. Chaubey into yet another expert witness for the State of Oklahoma, and the opinions that are elicited in this deposition in that context are untimely, and the defendants object to it. 09:31AM

MR. GARREN: And in response, I'm certainly asking him from his personal experience facts and other observations he's made, and I will reask the 09:31AM

question.

Q Based upon your personal experience, your observations, including your training and reading of published literature, do you have any idea or opinion about how far waste is generally taken from the poultry barn to be land applied? 09:32AM

MR. GEORGE: Same objection.

MS. LONGWELL: Object to form.

A Yes.

Q Tell us what you know. 09:32AM

A My understanding is that it does not travel too far. Economically it's not viable to transport poultry litter beyond a few kilometers from where it's generated.

Q With regard to that poultry litter or waste, in your study and in your investigations revolving around BMPs and water quality, is it important to know when poultry waste is land applied? 09:32AM

MS. LONGWELL: Object to form.

A Yes. 09:32AM

Q And in your work in the IRW, have you learned from either personal experience, observation or published literature, when poultry waste is generally applied, when it is? What time of year is my question. 09:33AM

A Mostly in the spring, from the spring until into the fall pretty much.

Q All right. In your study and investigation of poultry waste, its use and its effect on water quality, have you learned the nature and extent of the constituents contained within it? 09:33AM

MS. LONGWELL: Object to form.

A Yes.

Q What have you learned is the general constituents of poultry waste? 09:33AM

A The microconstituents are water, carbon, nitrogen and phosphorus, and there are some micronutrients such as copper, iron, arsenic and others.

Q Is zinc one of the micronutrients that are found? 09:34AM

A I think so.

Q Does poultry waste to your knowledge contain bacteria?

A Yes. 09:34AM

Q You mentioned earlier that you've done work in Moores Creek. Let me hand you what is Exhibit 3. Can you tell the court what this document is?

A This is a final report for a project named Optimizing BMPs, Water Quality and Sustained 09:35AM

says that Moores Creek has been studied -- looking at Page 1, the second paragraph, and I'll quote, Moores Creek watershed has been monitored continuously from 1991 to 2004, except for a period from October '97 to December '98. Did you rely on any of the monitoring data that was collected during that period for this report? 09:38AM

A Yes.

Q Tell the court, if you would, please, what were the general subject and objectives of the research that you performed as reported in Exhibit 3. 09:38AM

A We wanted to continue to collect water quality data from Moores Creek and Lincoln Lake, and then we wanted to assess best management practices that were implemented in the watershed and how they were effective in improving water quality, and another goal was to prepare a watershed management plan and, you know, combine that with outreach training and numerous activities, and then compile that out into a project report that was submitted to the funding agency. 09:38AM 09:39AM

Q In the executive summary of this report at the -- I believe the third sentence it said sources of NPS, that would be non-point source pollution, in 09:39AM

the Ozark Highlands of Arkansas have been linked to agricultural activities in the area, and it cites Edwards and Daniel for 1992 and Edwards and others for 1997. Are you familiar with these gentlemen?

A Yes. 09:39AM

Q Are you familiar with the work that's cited in this document?

A Yes. I had read the papers at that time.

Q All right. Based upon your knowledge, experience and review of that work, do you have an 09:40AM opinion whether the statement made by Edwards and Daniel is an accurate statement?

MS. LONGWELL: Object to form.

MR. GEORGE: Object to form, speculation and calls for new opinion. 09:40AM

A Yes.

Q What is that opinion?

A Agricultural activities in the areas are linked to elevated loads of nutrients.

Q When you say elevated loads of nutrients, 09:40AM elevated in relation to what?

A From what you can expect from undeveloped watershed.

Q Undeveloped watershed?

A Yeah. 09:40AM

Q Okay. From this report then and based upon your knowledge, experience and professional review of published literature, do you have an opinion when most of the phosphorus transport from fields to water bodies occur in the Illinois River watershed? 09:49AM

MS. LONGWELL: Object to form.

A Yes.

Q And when is that or what is your opinion?

MS. LONGWELL: Objection.

A From field to water bodies, it happens during storm flow events. 09:50AM

Q On Page 18 of your report, there is a statement I would like to ask you about in the first sentence of the first full paragraph. It says, and I quote, from a purely economic perspective, producers are best served by avoiding best management practices. Did I read that correctly from the first sentence there, Dr. Chaubey? 09:50AM

A Yes.

Q Can you tell the court what you meant by that statement in this report? 09:50AM

A We were looking at cost benefit analysis of different best management practices and comparing that to the baseline, and I believe I have defined the baseline somewhere here in this report. So most 09:51AM

A So there were no calculations performed for any part of the watershed beyond that.

Q Okay, but let me ask you this then: Based on that and your knowledge of what occurs in this portion of the stream, is there any reason to expect that the phosphorus in the water would act differently past that gauging station? 10:32AM

MS. LONGWELL: Object to form.

MR. GEORGE: Object to form.

A No. 10:32AM

Q Is the concept of movement of phosphorus in streams commonly known within the scientific community in your opinion?

A Yes.

Q Based on your knowledge, skill, education, training and of review of published literature, do you have an opinion if nutrients are eventually delivered to downstream water bodies, such as lakes and reservoirs, once they reach the stream? 10:33AM

MS. LONGWELL: Object to form. 10:33AM

A Yes.

Q What is that opinion?

MR. GEORGE: Object to form.

MS. LONGWELL: Objection.

A Once phosphorus is delivered in the streams, 10:33AM

it eventually makes its way downstream.
Q Let me ask you a hypothetical. If there was -- if there was no more land-applied poultry waste in this IRDA, will there be continued loading of nutrients to the water? 10:34AM
MS. LONGWELL: Object to form.
MR. GEORGE: Object to form, seeks expert opinion that's not timely disclosed.
A Yes.
Q If there was a cessation of land application 10:34AM of poultry waste in the entire Illinois River watershed, is there -- do you expect a continuation of loading to the water of nutrients?
MS. LONGWELL: Object to form, calls for a non-disclosed opinion. 10:34AM
A Yes.
Q Sitting here today, based upon your knowledge, experience, training, your review of published literature, can you make an estimate of the length of time it would take, without further land 10:35AM application occurring, for the nutrient concentrations in the Illinois River watershed to return back to a baseline or a more normal level?
MS. LONGWELL: Object to form.
MR. GEORGE: Object to form, calls for new 10:35AM

and undisclosed opinions.
A I've not made that calculation, but based on some of the other modeling that I've done in other watersheds, it can be done, and my best guess will be it will be a long time. 10:35AM
Q All right. When you say based on your experience and other modeling, can that answer be reached through modeling?
MR. GEORGE: Object to form.
Q Let me ask it this way: Can you quantify the amount or -- amount of time it would take or estimated to be taken to return to that normal level if there was a cessation of poultry litter application? 10:36AM
MR. GEORGE: Object to form, calls for speculation. 10:36AM
MS. LONGWELL: Object.
A It can be determined.
Q All right, and that would be determined through use of a model? 10:36AM
A Yes. That will be the most efficient way to do that.
Q All right. Let's talk a little bit about models. What kind of models exist that could be used to run that scenario and get a result or a 10:36AM

A So if the total numbers that you measure at Highway 59 bridge does not change, if that stayed the same, then percentage of point source contribution would decrease and percentage of non-point source contribution would increase, but if the numbers go down similarly, then you may have to look at that data. 10:41AM

Q Okay. In your professional experience and review of published literature, are you aware of any published paper that contradicts the findings and conclusions shown in Exhibit 8? 10:41AM

MS. LONGWELL: Object to form.

A No.

Q Based on the numbers on Table 2, Page 6 that you talked about earlier, the 1.8 million kilograms in 1997 versus the total input of 3.1 million kilograms, and based upon your knowledge, skill and education and training, including review of published literature, do you have an opinion whether poultry production practices of land applying waste is a substantial contributor of the phosphorus to the overall phosphorus loads within the watershed? 10:42AM 10:43AM

MS. LONGWELL: Object to form.

MR. GEORGE: Object to form, vague, calls for an expert opinion that's not been found by this 10:43AM

witness.
A Yes.
Q And what would be that opinion?
MR. GEORGE: Same objection.
A Based on inputs, poultry litter is the dominant source of phosphorus in the watershed. 10:43AM
Q All right. Is there anything else in your knowledge, experience that you rely on in making that opinion besides this Table 2?
MS. LONGWELL: Object to form. 10:43AM
A Other litter from this watershed and other watersheds and published journals and reports from others.
Q All right. Let's talk a little bit about some terminology. Are you familiar with the term surface runoff and -- well, let me just ask that. Are you familiar with that term? 10:44AM
A Yes.
Q In a hydrologic concept, can you tell the court what that means? 10:44AM
A What it means is when it rains, part of the precipitation travels through the soil surface or land surface, and that is primarily the surface runoff. It can also represent some of the water that travels partially through the subsurface but 10:44AM

statement?

MS. LONGWELL: Object to form.

A No.

Q Dropping down in that same paragraph, it goes on to say, and I quote, the potential impacts of excessive concentrations of pollutants, such as those just mentioned, are well known and include accelerated eutrophication, see for example, Sharpley, et al, 1994, and in extreme cases health hazards to humans and/or animals. Based upon your own knowledge, your investigation, research and review of published literature, do you agree that that's an accurate statement? 10:54AM 10:54AM

MS. LONGWELL: Object to form, calls for an untimely opinion. 10:55AM

A Yes.

Q Is there anything that's occurred since 1996 that would change your opinion about the accuracy of that statement?

MS. LONGWELL: Same objection. 10:55AM

A No.

Q What are some of the human health hazards that you are aware of that can occur as a result of excessive concentration of pollutants as mentioned in this paper? 10:55AM

MS. LONGWELL: Object to form.

A The pathogens and bacteria, we know they are health hazards to humans for different contact and for purposes of drinking water. There is water quality standard for nitrate. For example, if it is more than 10 milligrams per liter, we know it may lead to Blue Baby Syndrome. Pesticides, for example, we know that many of them have bad health consequences. 10:55AM

Q What was that again? 10:56AM

A Pesticides. Nutrients, when the lead -- when they cause eutrophication and excess algal bloom, may interfere with water treatment processes, and if they're not removed before cloudiness, we know they form a compound called trihalomethane, or THM, that is a suspected carcinogen. So there are some hazards that have been reported quite a bit in literature. 10:56AM

Q Why don't we take about a five-minute break here and let you stretch your legs and then we'll come back and resume. Okay? 10:57AM

A Okay.

MR. GEORGE: Rick, before we leave, do you think you're about done?

MR. GARREN: No. 10:57AM

Q And you link it with -- what is it you said?
A A routing model.
Q A routing model?
A Yeah.
Q Based on SWAT in your work in this, what is the largest source of P loading that you found? 11:25AM
MS. LONGWELL: Object to form.
A Non-point sources.
Q Okay, and were you able to determine which of the non-point sources were the largest of those? 11:25AM
MR. GEORGE: Object to form.
A It is difficult to parse out exactly, you know, each one of those sources. At least that's one limitation with some of the current models, but you can differentiate between point and non-point sources. 11:26AM
Q Well, let's go this way then. I think I heard you say that pasture is the largest percentage land use type; correct?
A Yes. 11:26AM
MR. GEORGE: Object to form, asked and answered.
Q We saw earlier the inputs in the exhibit, which was for 1997 1.3 kilograms, and you indicated that was the largest input; correct? 11:26AM

MS. LONGWELL: Object to form.

A Yes.

Q And I think you've said earlier that the typical and normal use of poultry litter is to land apply pastures; correct? 11:26AM

MR. GEORGE: Object to form, leading.

MS. LONGWELL: Object to form.

A Yes.

Q All right. You testified to that earlier, did you not? 11:27AM

A Yes.

Q All right, and based on that, can you yourself, based on your professional experience, training, education, working with SWAT, conclude what might be the largest source contributor of 11:27AM those factors?

MR. GEORGE: Object to form. The witness is being asked to offer an opinion that he's never before formed in his connection with his work that's been discussed in this deposition, and it's untimely 11:27AM and it's improper.

Q You can answer the question.

A There are some generalities that can be deduced from parts of the watershed from other modeling activities that I've done and have been 11:27AM

reported in literature by others. Usually the losses are proportional to the input, with few exceptions that may be there.

Q In your SWAT model, when you reduce -- in your scenarios you decrease the non-point loadings, did you decrease all of them on the same percentage or did you pick one or the other to make a decrease? 11:28AM

A You know, it has been awhile since we did this study, but best of my recollection, we went and decreased the poultry litter application rates in the watershed. 11:28AM

Q Was that the only reduction of poultry -- I mean, was that the only reduction of non-point loadings then that you performed in these scenarios? Take your time and read the report if you need to refresh your recollection. 11:29AM

MR. GEORGE: While the witness is reading, I didn't hear the last answer, Rick. Can you --

MR. GARREN: We'll read it back to you while he is reading. 11:29AM

(Whereupon, the court reporter read back the previous answer.)

MR. GEORGE: Thank you, Lisa.

A You know, again, it has been several years since we did this model application, but I believe 11:29AM

surface-applied poultry litter and swine manure.
Q Okay. The report also says that the transport of suspended solids and chemical oxygen demand was also reduced by the vegetative filter strips but generally not to the extent of other litter and 11:48AM
manure constituents. Can you tell me what those other manure or litter constituents were?
A They were ammonium nitrogen, total nitrogen, phosphate, phosphorus, total phosphorus and fecal coliform. 11:48AM
Q Do you know which ones were not as -- where the vegetative filter strips were not as effective, as to which constituents?
A Sediment and chemical oxygen demand.
Q All right. Can suspended solids include 11:48AM
bacteria?
A Suspended solids carry -- can potentially carry a number of other constituents, and bacteria can be or has been studied both as sediment in test form and, you know, equivalent to soluble form. 11:49AM
Q Based upon your knowledge, experience and review of published literature, does bacteria travel besides in a suspended solid state?
A It can travel --
MR. GEORGE: Object to form. 11:49AM

A It can travel in the dissolved -- equivalent to a dissolved form, yes.
Q So when you say in dissolved form, would that be like a liquid state?
A It is -- it's small enough that, you know, it is not retained on the filters. 11:49AM
Q So it flows in the --
A It will be similar to -- the behavior will be similar to what you would see in the dissolved nutrients, for example. 11:50AM
Q All right. Looking at the introduction at Page 2, there's a statement there at the very top that says, and I'll read it, land disposal of animal manure is widely recognized as an economic means of productively using manure constituents as well as an effective disposal technique. Did I read that correctly? 11:50AM
A Yes.
Q And when you put this in your report, had you done any study or investigation to support that statement? 11:50AM
MR. GEORGE: Object to form.
A It was based on a number of papers that I had reviewed in conjunction with this study.
Q So when your paper then is produced somewhere 11:51AM

manure has got some useful nutrients, that when utilized properly can enhance crop production, but at the same time because of the nutrient imbalances, you know, it can lead in to some potential problems, too. So that's why I'm using -- in this sentence using both components. 11:57AM

Q If a poultry farmer is applying the poultry waste at a rate in excess of the agronomic needs, is that an appropriate use as you've used the term?

MR. GEORGE: Object to form, calls for a new opinion, lack of foundation, vague. 11:58AM

MS. LONGWELL: Objection.

A That is waste disposal in my opinion.

Q Looking at Page 10 of your report, where it -- in the first full paragraph in the middle it talks about and says specifically and, I'll quote, under concentrated flow conditions, however, vegetative filter strips' effectiveness was greatly reduced. Tell me what that means, if you would, please. 11:58AM

A So when we designed these vegetative filter strips, we designed them to have uniform seed flow, and they are most effective under that condition. If the conditions change in a way that you have got concentrated flow, such as small channels running through the filter strip areas and flow is not 11:59AM

IN THE UNITED STATES DISTRICT COURT FOR THE

NORTHERN DISTRICT OF OKLAHOMA

W. A. DREW EDMONDSON, in his capacity as ATTORNEY GENERAL OF THE STATE OF OKLAHOMA and OKLAHOMA SECRETARY OF THE ENVIRONMENT C. MILES TOLBERT, in his capacity as the TRUSTEE FOR NATURAL RESOURCES FOR THE STATE OF OKLAHOMA,	)
Plaintiff,	)
vs.	) 4:05-CV-00329-TCK-SAJ
TYSON FOODS, INC., et al,	)
Defendants.	)

- -

VOLUME II OF THE VIDEOTAPED

DEPOSITION OF INDRAJEET CHAUBEY, PhD, produced as a witness on behalf of the Plaintiff in the above styled and numbered cause, taken on the 2nd day of March, 2009, in the City of Tulsa, County of Tulsa, State of Oklahoma, before me, Lisa A. Steinmeyer, a Certified Shorthand Reporter, duly certified under and by virtue of the laws of the State of Oklahoma.

A That is correct.
Q Okay. Based on your knowledge, skill, education, training and experience, including knowledge of published literature, do you have an opinion regarding the sustainability of buffer strips? 08:24AM
MS. TUCKER: Object to form.
MS. LONGWELL: Object to form.
A Yes.
Q Can you tell us what that opinion is? 08:24AM
MR. BOND: Same objection.
A For buffer strips or filter strips to work properly, they need to be maintained so that a uniform flow or sheet, S-H-E-E-T, flow is maintained throughout the width of the buffer. If they're not 08:25AM maintained properly, and there has been lots of published literature on that, they may lead into concentrated flow through the buffer width, and whenever the flow becomes concentrated, their effectiveness goes down significantly. 08:25AM
Q Okay. Let me hand you Exhibit 11 and ask you if you had an opportunity to see that document before.
A I am somewhat familiar with this paper. It's been a while since I read it. 08:25AM

Q To properly maintain the buffer strip -- let me ask it this way: Is it wise to have cattle grazing in buffer strips?

MS. TUCKER: Object to form.

A It is not wise to have cattle grazing in the buffer strips. 08:29AM

Q Tell the court why that would not be good to occur.

A A few things can happen if you are grazing cattle in the buffer strip areas. Grazing is documented to result into compaction of the soils. So as a result of compaction, there may not be as much infiltration taking place in the buffer area, and infiltration is one of the primary mechanisms by which pollutants are retained in filter area. 08:29AM Secondly, depending upon how animals are moving in the filter strip area, it may result into a concentrated flow development.

Q If -- let me ask you this also: If cattle were allowed into buffer areas or riparian areas 08:30AM after they've been grazing on the field, a field that's been applied with poultry litter or waste, what is the effect of their defecating near a riparian area at that point?

MS. LONGWELL: Object to form. 08:30AM

MR. BOND: Object to form.

A So when you are looking at grazing impacts, one of the things that happens through the grazing process is recycling of the nutrients. So they -- the cows recycle nutrients from the grasses, and then in the process of defecating, then they may deposit it at some other point within the landscape. So in that process, they may bring it closer to the stream or in the stream. 08:30AM

Q That process would result in the acceleration of its movement from the middle of the field to the edge of field; is that correct? 08:31AM

MS. LONGWELL: Object to form.

MS. HILL: Object to form.

A Theoretically, yes, it is possible. 08:31AM

Q Okay, and in your experience in the field, and in particular in the IRW, have you ever observed cattle standing in streams in high flow events?

A I have observed cattle standing in the stream during low flow events on a sunny day like this, but I have not observed it in runoff events or high flow events. 08:31AM

Q Is -- do you have an opinion whether cattle then are a direct contributor of phosphorus during high flow events? 08:32AM

MS. TUCKER: Object to form.

MS. LONGWELL: Object to form.

A Yes.

Q What is that opinion?

A I don't think that they directly contribute phosphorus or manure deposits in the stream directly during the high flow events. 08:32AM

Q And that is because why?

MS. TUCKER: Same objection.

A Lots of streams during high flow events in my opinion, and I've seen the flow data, there is lots of flow during that time, and anyone, including animals, physically it will be nearly impossible to be standing in the stream during that time period without, you know, getting washed down the stream. 08:32AM 08:32AM

Q So based upon your work with the mass balance, your knowledge, skill, education, training and the experience, including knowledge of published literature, do you have an opinion whether poultry production practices of land applying waste is a substantial contributor of poultry to the overall P loads within the Illinois River watershed? 08:33AM

MS. TUCKER: Object to form.

MS. HILL: Object to form.

MS. LONGWELL: Object to form, soliciting 08:33AM

undisclosed opinions.
A So we did this mass study in the Illinois River watershed to look at all the sources of input, including point sources and non-point sources, and if you look at that mass balance, poultry litter is 08:33AM
the biggest input coming into the landscape. I believe it was 1.8 million kilograms out of 3.1, something like that, and we know that from all the field plot or water studies, scale studies where
people have documented even a single treatment, it 08:34AM
leads into the phosphorus losses. So by that, I would think that because of outfluxes coming from the land application of poultry litter.
Q Let's see. I think we're on -- if a
vegetative filter strip degrades over time, is -- 08:35AM
what does that do to the effectiveness of its ability to filter constituents that run off the field?
MR. BOND: Object to the form.
A Their ability decreases significantly, and 08:35AM
that has been documented in literature.
Q What kind of maintenance would you normally expect to see in order to attempt to keep the effectiveness of a buffer strip?
A A good vegetative cover must be maintained all 08:35AM

2008. Can you tell us generally what was the time frame of the study that was conducted?

A I believe we collected data over a two-year period. I think it was 2004-2005 or 2005-2006.

Q So we're looking at a two-year period time frame? 08:39AM

A We are looking at a two-year period time frame. We collected rainfall runoff data for every single event that took place within that two-year time frame. 08:39AM

Q All right, and these are natural rainfall events?

A These are all natural rainfall events.

Q Was there any simulated rainfall events?

A No. 08:40AM

Q All right, and the area that this study was conducted, tell the court where that is.

A The study was conducted in the Savoy Experimental Watershed. Savoy Experimental Watershed or SEW, as we refer in this paper is subwatershed within the Illinois River watershed. 08:40AM

Q All right. It's not far from Fayetteville; is that correct?

A It is not far from Fayetteville, yes.

Q All right. Look at the introduction in the 08:40AM

Q Correct.
A And for some of the other studies, also the SWAT modeling that we did, we looked at the data that was collected at Highway 59 bridge by Marc Nelson's group. 09:03AM
Q Here's my question, though, and I'm trying to make it a little more clear: Those gauging stations measured concentrations of various nutrients and other chemicals; correct?
MR. BOND: Objection, leading. 09:03AM
A Yes.
Q When those waters pass that gauging station carrying those nutrients, where do they go?
MR. BOND: Object to form.
MS. LONGWELL: Object to form. 09:03AM
A They move down the stream just like, you know, we see in the upper stream gauging stations. They continue to move down the stream with the stream flow.
Q All right. We've talked about Moores Creek. 09:04AM That's a subbasin, correct, of the Illinois River watershed?
A Yes.
Q Flint Creek would be another subbasin, for example? 09:04AM

Q All right. The studies that you refer to, were they looking specifically at poultry-applied fields, poultry waste-applied fields?

A Lots of these studies, yes, they were looking at fields applied with poultry litter. 09:37AM

Q And in those studies, was the source of that poultry waste the same for each study?

MR. BOND: Object to form.

MS. LONGWELL: Object to form.

A It's hard to say, but it's hard to believe that the source was same. They have to be different because the studies were done at different times in different areas. 09:37AM

Q Based upon your studies, knowledge and experience and reading published literature, is there any reason that you're aware of why land-applied poultry waste from a different integrator's birds would behave differently under similar environmental circumstances? 09:38AM

MS. HILL: Object to form. 09:38AM

MS. LONGWELL: Object to form.

MR. BOND: Object to form.

A They will behave very similar if the composition of the litter is same. So there may be some differences from bird types, but within the 09:38AM

same type of birds, the litter would behave similarly when applied to the --

Q Where do you think there would be differences from bird types?

MR. BOND: Object to form. 09:38AM

A So my understanding is, for example, manure from layers has a lot more moisture content than litter from broiler production, and because of the consistency in the manure, because of the difference in the moisture content, it may behave differently 09:39AM during the transport processes.

Q You've studied wet manures in the past, have you not?

A I have not studied wet manures in the past. My studies were with the poultry litter. 09:39AM

Q Did you do a comparison study at one time between poultry litter and swine manure?

A I did.

Q And was that swine manure a wet manure?

A That swine manure was very wet manure, yes. 09:39AM

Q Were the characteristics exhibited by the wet swine manure significantly different than those of dry poultry litter?

MR. BOND: Object to form.

MS. TUCKER: Object to form. 09:39AM

cites Green and Haggard in 2001. Did you review that study?

A I have seen Green and Haggard 2001 study.

Q And is that one of the studies you talked about that had drawn similar conclusions as this study? 09:51AM

A Uh-huh.

Q Would that be a yes?

A Yes.

Q Thank you.

A I'm sorry.

Q In your opinion, Dr. Chaubey, is there a correlation between high STP levels and rates of poultry waste manure or poultry litter application?

MS. TUCKER: Object to form. 09:52AM

MR. BOND: Object to form.

Q Let me restate it. Based upon your knowledge, experience and expertise in this area, is high STP levels in soil an indicator of poultry waste application rates in excess of plant requirements? 09:52AM

MS. TUCKER: Same objection.

MR. BOND: Object to form.

MS. HILL: Object to the form.

MS. LONGWELL: Object to form. Calls for an undisclosed expert opinion. 09:52AM

A Yes.
Q What do you base your opinion on?
MS. LONGWELL: Same objection.
A There have been a number of published studies that indicate that if you apply animal manure, including poultry litter, in excess of what is needed by plants, then phosphorus would accumulate over time and that would be indicated as high STP.
Q Dr. Chaubey, can losses of nutrients occur from fields that are low in STP? 09:54AM
MS. TUCKER: Object to form.
MS. LONGWELL: Object to form.
A Yes.
Q And how is that; why does that occur?
MS. LONGWELL: Same objection. 09:55AM
A Runoff when it interacts with the soil, it will pick up nutrients, including phosphorus, from the soil column if any amount of phosphorus is present there. The level of magnitude may be different depending upon the STP. That's why you see some amount of phosphorus coming from entirely forested areas, which may have very, very low STP values. 09:55AM
Q Let's kind of change the subject a little bit.
Are you familiar with what's referred to as the 09:56AM

found, that Arkansas P index allowed more litter application under similar conditions compared to ESPI.

Q Okay, and this was published in 2006. Do you know, sir, whether or not there's been any modification to the Arkansas phosphorus index since you did your work in the Eucha-Spavinaw? 10:01AM

A I don't know what has happened. I've not tracked that down.

Q All right. Does the use of either the Eucha or the Arkansas phosphorus indices eliminate risk to water quality from land-applied poultry waste? 10:01AM

MR. FREEMAN: Object.

A It does not eliminate the risk. It reduces the risk. 10:01AM

Q If it only reduces the risk, is a phosphorus index a solution, a long-term solution to nutrient pollution as we see in the Eucha-Spavinaw?

MS. LONGWELL: Object to form.

MS. TUCKER: Object to form. 10:02AM

MS. HILL: Object to form.

MR. BOND: Object to form.

A Conditions need to be evaluated continuously and carefully, and a phosphorus index may not be a long-term solution in any watershed. 10:02AM

Q Does the -- does a phosphorus index ensure that bacteria will not enter the waters?

MS. LONGWELL: Object to form.

MS. TUCKER: Object to form.

A No. 10:02AM

Q Is a phosphorus index designed to limit the amount of bacteria getting into water from land-applied poultry fields?

MS. LONGWELL: Object to form.

A No. 10:03AM

Q Is a phosphorus index, such as the Eucha or the Arkansas phosphorus index, designed to achieve any water quality standard?

A No.

Q Is the -- are the Arkansas or the Eucha-Spavinaw indexes designed as quantitative? 10:03AM

A No.

Q When you did your work for the Eucha-Spavinaw index, were you given a target to achieve from its use? 10:03AM

A There was no target.

Q Based upon this paper and your previous testimony, is it correct then that since more waste can be applied under the Arkansas P index, then it is less protective of water quality than the 10:04AM

Eucha-Spavinaw index?

MS. HILL: Object to form.

MS. LONGWELL: Object to form.

MR. FREEMAN: Object to form.

MR. BOND: Object to form. 10:04AM

MS. TUCKER: Object to form.

A Yes, that can be a conclusion that can be drawn.

Q Since your work as described and published in 2006, have you had any other experience with the ESPI? 10:04AM

A No. I have now gone to Purdue, and I have not followed up this work anymore.

Q What -- what did you do to familiar (sic) yourself with the Eucha-Spavinaw watershed, such as its geologic conditions, characteristics, the hydrology that's seen in that watershed? 10:05AM

A So I looked at a number of data from this watershed, such as topography, land use, soils, land management, and looked at the USGS gauging instrumentation data that was presented there, and we also had a USDA-funded project going on around the same time frame on which I was a co-principal investigator, so we looked at the data that was coming from that project. 10:05AM

Q Based upon your knowledge, experiences both in Eucha, Illinois River and, of course, the Beaver Lake watersheds, are there areas in your opinion where specifically in the IRW agronomic need may exist but land-applied poultry waste should not be conducted?

MS. TUCKER: Object to form.

MR. BOND: Object to form.

MS. LONGWELL: Object to form.

MS. HILL: Object to form. 10:09AM

A There are areas where agronomic needs may exist but should not be treated with poultry manure.

Q Give me an example of where those kind of areas you might find in the Illinois River would be.

MS. TUCKER: Same objection. 10:09AM

MS. LONGWELL: Object to form.

MR. BOND: Object to form.

A You may have some areas near the streams that may be producing runoff very frequently. So there may be runoff source areas very often in any given year, and even if there is an agronomic need in those areas, the runoff losses, the risk of runoff losses is too high in my opinion to apply poultry litter. 10:10AM

Q Even at agronomic rates? 10:10AM

A That is correct.
Q Based on your knowledge and skill, education, training, including review of published literature, do you know if there is any natural land surface within the IRW that would never generate runoff? 10:11AM
MS. LONGWELL: Object to form.
MR. BOND: Object to form.
MS. LONGWELL: Calls for an undisclosed expert opinion.
A Theoretically, given the magnitude of the rainfall, there will not be an area that will not generate runoff. 10:11AM
Q Based upon your knowledge, skill, education, training and experience, including knowledge of published literature, do you have an opinion if all natural land surfaces within the IRW will generate runoff if there is sufficient rainfall? 10:11AM
MS. HILL: Object to form.
MS. LONGWELL: Object to form. Calls for an undisclosed expert opinion. 10:12AM
MR. BOND: Object to form.
A Yes.
Q What is your opinion?
MS. LONGWELL: Same objection.
A It will generate runoff. 10:12AM

Q Based on your knowledge, skill, education, training, experience, including knowledge of published literature, do you have an opinion whether observed data and models indicate non-point source pollution as a major contributor to phosphorus within the streams of the rivers of the IRW? 10:20AM

MS. HILL: Object to form.

MS. TUCKER: Object to form.

MS. LONGWELL: Object to form. Call for an undisclosed expert opinion. 10:21AM

A Yes.

Q And tell us what that opinion is.

MS. LONGWELL: Same objection.

A Non-point source pollution, non-point sources are the major sources of phosphorus in this watershed. 10:21AM

Q Have you done modeling on the -- for the Illinois River watershed?

A I have.

Q And what period of time have you been doing such modeling? 10:21AM

A Are you asking how long I have been doing this modeling?

Q Yes.

A Since I became faculty in 2000. 10:21AM

His models are widely used for making decisions by a number of state and federal agencies, and he is continually involved in developing those models or improving those models.

Q We need to take a break to change the tapes and we'll come back. 10:24AM

A Okay.

VIDEOGRAPHER: We are off the Record at 10:25 a.m.

(Following a short recess at 10:25 a.m., proceedings continued on the Record at 10:31 a.m.) 10:24AM

VIDEOGRAPHER: We are back on the Record at 10:31 a.m.

Q Dr. Chaubey, based again on your knowledge, skill, education, training and including knowledge of published literature, do you have an opinion as to whether phosphorus loading to Lake Tenkiller will increase in the future if application rates continue at current levels? 10:31AM

MS. TUCKER: Object to form.

MS. HILL: Object to form.

MS. LONGWELL: Object to form. Calls for an undisclosed expert opinion.

A It will not decrease. So depending upon how 10:31AM

the phosphorus builds up in the soil, which again goes back to the mass balance study we did, quite a bit of that accumulates, and depending upon rainfall events, it's likely that it may increase in the future. 10:32AM

Q If -- if poultry waste land application stopped, do you have an opinion, based upon your knowledge, skill, education and training, whether phosphorus loading will continue to occur to the waters of the Illinois River watershed? 10:32AM

MS. LONGWELL: Objection. Calls for an undisclosed expert opinion and objection to the form of the question.

A Yes.

Q What is the opinion? 10:33AM

MR. BOND: Same objection.

MS. LONGWELL: Same objection.

A It will continue for a considerable period of time.

Q And that's because of what; what happens to cause that? 10:33AM

A Because of the buildup of phosphorus in the soil column, that will continue to provide phosphorus to the runoff as a reservoir, and that may continue for long period of time. 10:33AM

10:36 a.m.

(Following a short recess at 10:36 a.m., proceedings continued on the Record at 10:42 a.m.)

VIDEOGRAPHER: We are back on the Record at 10:42 a.m. 10:41AM

CROSS EXAMINATION

BY MR. BOND:

Q Dr. Chaubey, my name is Michael Bond and I represent the Tyson defendants in this case. I believe we've spoken once before on the telephone. Do you recall that? 10:41AM

A I recall that.

Q Okay, and beyond that, we've never had any conversations; correct? 10:42AM

A Yes.

Q Okay. Describe for me what you did to prepare for what I'm calling day two of your deposition, which is today.

A I did not prepare anything. I didn't even go through some of my papers that we talked about. We had a brief meeting in Mr. Garren's office yesterday, talked about the process and a few of the questions, but beyond that, there was no preparation on my part involved. 10:42AM

Q Did you read your deposition transcript from day one of your deposition?

A I was E-mailed that transcript, and I read it on my way here, yes.

Q Okay. How long -- did you talk with Mr. Garren between the first day of your deposition and the second day of your deposition other than the meeting in person? 10:43AM

A No, we did not talk.

Q Okay. During your meeting yesterday -- strike that. How long was your meeting with Mr. Garren yesterday? 10:43AM

A I believe it was an hour.

Q An hour?

A Yeah. 10:43AM

Q Okay. What specifically did you talk about?

A We -- it's hard to recall everything that we talked about because there was nothing that was striking in my mind, you know, from ranging from classes that I have been teaching at Purdue and how things are going in the research to what the process will be today, and he talked about some of the papers that would be used in some of the questions that he would ask. 10:43AM

Q Okay. Did he actually ask you the questions, 10:44AM

some of the same questions that he asked you today?
A He gave me an example of some of the questions, but I don't think he asked any of the questions exactly yesterday. He said that these are the kind of questions I may ask you tomorrow. 10:44AM
Q Okay. With regards to day one of your deposition, which was taken previously, tell me what was done to prepare for that.
A On my part?
Q Yes. 10:44AM
A I did not know how to prepare for that, except look at the list of my papers and publications, and there were too many for me to read, given all of the responsibilities I've got at Purdue.
Q Uh-huh. 10:44AM
A So I didn't know how to prepare, so I did not prepare.
Q Okay. Did you -- you didn't review any of your prior work related to the Illinois River watershed before your first day? 10:45AM
A I -- I may have skimmed through the pages to refresh my memory, but I did not read any of the papers in detail.
Q Did you have any conversations with Mr. Garren or any other counsel for the State of Oklahoma prior 10:45AM

to your first day?
A We had one meeting at Purdue with Mr. Garren and Mr. Louis -- I don't remember his last name.
MR. GARREN: Bullock.
Q Mr. Bullock? 10:45AM
A Mr. Bullock.
Q When was that meeting?
A I don't remember the day or the month, but a few months ago.
Q Okay. They traveled out to see you? 10:45AM
A Yes.
Q Did they meet with anyone else while they were there?
A In -- Dr. Bernie Engel was present in that meeting, too. 10:46AM
Q Okay. So let's get an idea of who all was in the meeting. Right now I understand it was Mr. Bullock, Mr. Garren, you and Dr. Engel?
A Yes.
Q Was that everyone that was in that meeting? 10:46AM
A I think that was everyone in that meeting.
Q And how long did that meeting last?
A It lasted probably two to three hours, and then we went for lunch.
Q Did you talk about a deposition in this case 10:46AM

during that meeting?
A I was asked if I would be willing to make a deposition, and my answer was yes.
Q Okay. Why were you willing to give a deposition? 10:46AM
A I believe science should guide the policy in any area, and someone who has worked extensively in the watershed management and non-point source pollution, looking at data collection, looking at modeling, if my knowledge and expertise can guide 10:47AM the policy decisions, I believe in that. So that was what motivated me to say yes.
Q So you have a personal and a professional interest in this?
A I have a professional interest into this. 10:47AM
Q Dr. Engel is one of your peers?
A Yes.
Q At Purdue?
A Yes.
Q Does he have any supervisory capacity or review capacity over you? 10:47AM
A He is the department head in one of the three departments in which I have an appointment right now.
Q During this meeting with Dr. Engel, Mr. Garren 10:48AM

and Mr. Bullock and yourself, did you review any documents?

A I did not review any document during that meeting.

Q Were you shown any documents? 10:48AM

A Mr. Garren had a three-ring binder like that, but I don't recall taking that -- I mean, not that, but a binder like that in my hand and going through that. So I don't know what was in there. We just sat down and talked. 10:48AM

Q Okay. Did they ask you specific questions about studies you worked on?

A Yes.

Q Okay. Can you tell me -- do you recall anything about that? 10:48AM

A So I remember one of the studies we talked about was my runoff study that I did in Savoy Experimental Watershed, what kind of things I've done and what I've found. We talked in general about my Moores Creek studies and what was the 10:49AM purpose and what were the conclusions.

Q Okay.

A So a general discussion about some of the work that I have done in this watershed.

Q Okay. Did you know when they first came to 10:49AM

see you that they were going to ask you to give a deposition in this case?

A I did not know that.

Q When during the meeting did they ask you that, at the beginning, middle or the end? 10:49AM

A Sometime towards the middle, you know, Mr. Garren asked me, Dr. Chaubey, would you be willing to do that.

Q Okay, and did you hesitate at all, think about it or did you just say okay? 10:49AM

A I thought about it. I mean, you know, it requires time, and I don't have time to say yes to every request that comes my way.

Q Okay.

A So I thought about it. 10:50AM

Q Have you given a deposition before?

A No. This is my first deposition.

Q Okay. Have you ever been retained in a lawsuit?

A No. 10:50AM

Q Okay, but you did work with the special master in the Eucha-Spavinaw case?

A Yes.

Q When did you give them your answer as to whether or not you were willing to give the 10:50AM

deposition; during that meeting?
A Because it was a general question, my general answer was, yes, I will be willing to do that.
Q Okay, and you gave that answer during the meeting? 10:50AM
A I believe so.
Q Okay, and during that meeting you agreed to travel to Tulsa for the deposition as opposed to it being in your own hometown?
MR. GARREN: Object to form. 10:51AM
A We did not discuss any specifics, so it was just one general question.
Q Okay. Well, did you think the deposition would be at Purdue or did you think it would be here? 10:51AM
A I had no idea because I didn't think about it.
Q Okay, and are all of your expenses associated with this deposition being taken care of by the plaintiff's counsel?
A The hotel and airfare has been directly advanced by Mr. Garren. 10:51AM
Q Okay. I mean, are they allowing you to eat?
A Yes, and I have not submitted my receipts yet, so -- and I frankly don't even have all my receipts, so I don't know. There is no per diem or anything. 10:51AM

We have not talked about it.
Q Okay. Have you incurred any other expenses beyond airfare and hotel?
A Parking at the airport of my own vehicle.
Q What's the total expenses so far for you to involve yourself in this? 10:52AM
A I don't know. You know, I've not summed it up to know that and, frankly, I don't even know what the airfare -- I guess it's on the receipt but I have not paid attention. 10:52AM
Q Okay. Do you expect to be compensated for your time associated with this?
A I don't.
Q If your -- strike that. So you had that meeting at Purdue. Did you have any other meetings or conversations with plaintiff's counsel about your deposition prior to your first day? 10:52AM
MR. GARREN: Object to form.
A I had one introductory meeting as in just the greetings meeting with David Page when he was at Purdue at one time. We just exchanged greetings and -- because I happened to be in the room where they were meeting, but beyond that, there was no other discussion. 10:53AM
Q So did Mr. Page come to Purdue and meet with 10:53AM

Dr. Engel?

A I don't know who he was meeting. I -- I -- I have no idea.

Q Well, who was in the room?

A When I met him? Dr. Engel was in that room, yeah, so but -- 10:53AM

Q Anyone else?

A At that time? You know, I don't remember --

Q Okay.

A -- anyone, besides him, from Purdue. 10:53AM

Q And how long were you in that meeting?

MR. GARREN: Object to form.

A Less than five minutes.

Q Less than five minutes?

A Yeah. 10:53AM

Q There were others in that room but not from Purdue. Who were the others? Dr. Wells?

A Who is Dr. Wells?

Q He's a modeler. Don't know him?

A I don't know him. 10:54AM

Q Okay. Meagan Smith, do you know her?

A I don't know her.

Q Don't know her, okay. All right. You were in that meeting for five minutes. What were they discussing in this meeting? 10:54AM

A I -- I don't know if they were discussing anything during the time I was there. It was all, you know, extending greetings, introducing one another, but nothing beyond that. I left the room because I had no interest or time to be in that meeting. I don't think I was invited to be in that meeting either. 10:54AM

Q Well, that's my next question. How did you end up in there?

A The meeting room was right next to my office, and I have my group meetings, meetings with my students, my associates all the time. So it may have overlap during, you know -- and I meet in that room all time because that's one of the two conference rooms we have in our building. I don't remember the context because I know I was not invited to be a part of that meeting. 10:55AM

Q Have you talked to Mr. Page at any other time?

A Except extending greetings in this building, no. 10:55AM

Q No, okay. What did you talk about in the five minutes that you were with Mr. Page? It doesn't take more than five minutes to just introduce. So that's why I'm asking that.

A Yes. So he asked me how long I was at Purdue 10:56AM

and he asked me if I was doing similar work I had done from Arkansas. I assumed he was familiar with my work in Arkansas, and how things, you know, were going at Purdue, how I liked it. So it's general talks that I would expect anyone to talk who was familiar with me in Arkansas and now met me at my new workplace. 10:56AM

Q Okay. All right. What about any other meetings you've had? So let me sum it right now. Before the first deposition, you met with Mr. Garren and Bullock at Purdue. You met Mr. Page briefly. Any others? 10:56AM

A In connection with this case?

Q Yes.

A I don't recall any other meetings. 10:56AM

Q Okay. So when you arrived in Tulsa for your first deposition, you had no meetings with plaintiff's counsel prior to that deposition being commenced, like the day before?

MR. GARREN: Object to form. 10:57AM

Q Didn't meet with them?

A So I met the day before my first deposition, again, with Mr. Garren here in his office.

Q Okay. Tell me what happened in that meeting.

A We talked about what to expect the next day 10:57AM

because this was my first deposition ever, went through the format, kinds of questions he might be asking, kind of things I might expect from the defendants' attorneys who may be present in the room. So he was familiarizing me with the process with the kind of questions, with the kind of things that would happen the next day. 10:57AM

Q And you're aware that Dr. Engel is a retained expert by the State of Oklahoma in this lawsuit; correct? 10:58AM

A I found out recently about it.

Q Okay. How did you find out about that?

A It -- I don't know that he is a paid expert but I know that he has been involved in this lawsuit, but I don't know about the payment arrangement. 10:58AM

Q Okay. Well, how do you know about his involvement?

A I have asked him if he was involved, and his answer was yes. 10:58AM

Q Okay. How did you know about the lawsuit?

A Lots of things were developing when I left Arkansas with this water quality conflict between Oklahoma and the defendants here. So for the time period, I had followed up, you know, talking to my 10:59AM

colleagues here in northwest Arkansas because we are still working on a number of projects together, so these kind of things come up and so you find out during those conversations.

Q Okay. I didn't catch the name of the person that you're talking about. Did you say Marc Nelson? 10:59AM

A I don't think I --

Q Okay. All right.

A I said my colleagues.

Q Colleagues? 10:59AM

A Yeah.

Q Okay, all right. Colleagues that are still at the U of A?

A Yeah, yeah.

Q Okay, all right.

A And we still have got projects going on with them.

Q Okay. So, I mean, have you continuously followed the lawsuit --

MR. GARREN: Object to form. 10:59AM

Q -- since you left?

A No, I have not.

Q Okay. You're just aware of its existence?

A I'm -- I'm aware that it exists.

Q What prompted you to ask Dr. Engel if he was 11:00AM

working on a lawsuit in Oklahoma?
A I had heard that when I was involved in the Eucha-Spavinaw. He was one of the expert witnesses at that time, although I had never met with him in that context. 11:00AM
Q Okay.
A So out of curiosity, I wanted to know, and because I had seen Mr. Page at Purdue and I knew that Mr. Page is one of the attorneys in Oklahoma, and asked him. 11:00AM
Q Okay. Had you met Mr. Page before then?
A No.
Q How did you know he was one of the attorneys in Oklahoma?
A I had -- I may have heard his name in some conversation. 11:00AM
Q Okay. All right. This part I'll jump around a little bit.
A Okay.
Q It will have little to no rhyme or reason to the order, so it's just me kind of looking through my notes and figuring things out here, but I want to understand some of the opinions that you've given here. First of all, I mean, do you believe that a vegetative filter strip or a buffer strip to be an 11:01AM

effective tool in improving water quality?

MR. GARREN: Object to form.

A If installed and maintained properly, it can retain a significant amount of nutrients moving through the filter area. 11:01AM

Q So is that a yes or a no?

MR. GARREN: Object to form.

Q Is it effective or is it not?

A It depends how you maintain it. If it is installed properly, if it is designed properly and 11:02AM if it is maintained properly, it will reduce the risk of water quality degradation significantly.

Q So similar to other tools or uses in life, if it's set up correctly and maintained, it works; correct? 11:02AM

MR. GARREN: Object to the form.

A It works depending upon what your purpose is or what your objective is.

Q Okay. What's the life span of a vegetative buffer strip in the Illinois River watershed; do you 11:02AM know?

A I don't know that.

Q Okay. Can you tell me anywhere in the Illinois River watershed where ineffective vegetative buffer strips are located? 11:03AM

MR. GARREN: Object to form.

A If you look at some of the riparian areas, you see animal crossings.

Q What kind of animal?

A Cows grazing in the surrounding pasture areas. 11:03AM

Q Okay.

A And that -- the results of that may result into degradation and significant erosion and development of generalized flow through the riparian area, and there are at least two sites that I have 11:03AM seen and they're mostly where I have worked quite a bit.

Q So let me see if I understand. Basically you're talking about areas where cattle cross streams or creeks in the Illinois River watershed; 11:04AM correct?

MR. GARREN: Object to form.

A Based on my direct experience, yes.

Q Okay. And basically what's happened is a path has been worn out and it's like a little trail that 11:04AM they walk on consistently; correct?

A It may be more than just a worn-out path. It may be areas surrounding that path.

Q Okay. How many of these areas are you familiar with? 11:04AM

A I have seen two of them personally, but I don't know how many of them are there.
Q Okay. Do you know who owned the land where those were at?
A I don't know who owned the land. 11:04AM
Q Did you see them from the water or were you on them?
A Both.
Q Okay. Did you feel the need to mention it to anyone that maybe they ought to, you know, replant 11:05AM the vegetative buffer strip there or fence the cattle out?
MR. GARREN: Object to form.
A I don't think it was in my authority to tell it to anyone what they had to do. I was there 11:05AM collecting data, working on the project that I was funded to work on. We discussed this in -- these things get discussed in meetings all the time.
Q Okay. Let me get a better understanding of what type of mass balance work you've done with 11:05AM respect to the Illinois River watershed. Can you just, you know, briefly describe for me your professional experience in performing mass balance study on the Illinois River watershed.
MR. GARREN: Are you asking him to repeat 11:06AM

what he's already testified to in day one?

MR. BOND: Just a brief summary of it.

MR. GARREN: Object to form.

A We looked at different sources of nutrients in the Illinois River watershed, including both point and non-point sources. We looked at the water quality data measured by Dr. Marc Nelson, and we performed basically mass balance based on that, so that was one of the studies. 11:06AM

Q Okay, and you're an author of that study? 11:06AM

A There were several reports produced, so --

Q Okay.

A In one of the reports I am not an author on that study, but in other reports I was the author on that study. My PhD student, who was working very closely with me throughout that project, was an author on all of the reports. 11:07AM

Q Okay, and Marc Nelson is an author on all those reports, too?

A Yes. 11:07AM

Q Correct?

A Yes.

Q And in these mass balance studies, it -- I mean, what's studied and what's shown in these is it shows the inputs of nutrients into a particular 11:07AM

area?

MR. GARREN: Object to form.

Q Correct?

A That's one of the components of that study.

Q Okay. They don't show contributions of specific nutrients to the water? 11:07AM

A Clarify that for me, please.

Q Well, do -- when you do a mass balance, are you just trying to determine the input of nutrients to the land or are you also talking about contribution of those nutrients to water? 11:08AM

A We are talking about both.

Q Okay, and with respect to the contribution of nutrients to the water, are you doing a fate and transport study in addition to your mass balance to show how they get from one point to the other? 11:08AM

A So you do the mass balance -- we did the mass balance from the Highway 59 bridge as an outlet point of view, and so the objective was to look at the contributing watershed area to that gauging station at Highway 59 bridge and look at all the inputs and outputs from that outlet point of view. 11:08AM

Q And like, for example, an input from a point source, it's going directly into the water?

MR. GARREN: Object to form. 11:09AM

my best to clarify. Have we ever met or spoken with one another before today's deposition?

A I don't think so.

Q I know your educational background was discussed on day one of your deposition, but I have a few follow-up questions. Do you hold any advanced degrees or certifications in limnology? 12:51PM

A My masters and PhDs were in biological and agricultural engineering. So there was some limnology applications in the work that I've done but -- 12:51PM

Q Do you consider yourself a limnologist?

A I consider myself a hydrologist, an ecohydrologist.

Q Do you consider yourself a microbiologist? 12:51PM

A No.

Q A toxicologist?

A No.

Q And I know you're an agricultural engineer. Are you an environmental engineer? 12:51PM

A So agricultural engineering has got different specialties, and environmental and natural resources is one of those specialties, and I work in that area.

Q Are you a sanitary engineer? 12:52PM

A No. I don't know if they gave a sanitary engineering degree.
Q Are you an agricultural economist?
A I am not an agricultural economist, but I work with agriculture economists quite a bit on a number of my projects. 12:52PM
Q Are you a medical doctor?
A No, I'm not.
Q Are you an agronomist?
A Again, no, but, you know, I work with a team of agronomist on a number of projects. 12:52PM
Q I know that your PhD thesis was in biosystems engineering and you studied hydrology. Are you a hydrologist?
MR. GARREN: Object to form. 12:52PM
A Yes.
Q Are you a fluvial geomorphologist?
A It's part of the hydrology, and I have done fluvial geomorphology work.
Q What was the time frame for the data collection for the Moores Creek Study? I think it's Exhibit 3 to this deposition. 12:53PM
A I believe --
MR. GARREN: Object to form.
A -- we went from 2001 to 2004, something around 12:53PM

have also published another paper that came out last year involving SWAT modeling in Illinois River basin. So it was co-authored by Dr. White and myself. There were only two authors on that.

Q And the date of that paper is 2008; is that correct? 01:03PM

A I believe 2008. I think that's when it came out, or 2007, one of the two years. If you look at my list of publications, either 2007 or '8.

Q But that has not been introduced as an exhibit in this deposition over the two days? 01:03PM

A I don't think so.

Q Have you had any discussions with Dr. White regarding this litigation?

A No. 01:03PM

Q Have you had any discussions with Dr. White about your deposition?

A No.

Q Let's take a look at Exhibit No. 6. Now, Exhibit No. 6 studies Beaver Lake; is that correct? 01:04PM

A Yes.

Q Is it your intention to offer to the court any opinions regarding the Illinois River watershed based on the conclusions reached here regarding Beaver Lake? 01:04PM

MR. GARREN: Object to form.

A My intention is to offer opinions about how -- these agricultural watersheds we have and specifically the watersheds that may be in the similar physiographic regions with similar hydrologic, geologic soil characteristics. 01:04PM

Q So you do intend to opine that because you see certain things happening in Beaver Lake, that might be also applied in the Illinois River watershed?

MR. GARREN: Object to form. 01:05PM

A Some of the processes will be similar.

Q And what processes are you referring to?

A I am talking about rainfall runoff processes. I am talking about how different land use activities respond to hydrology and water quality. 01:05PM

Q And those processes can vary a tremendous amount across one basin; is that not correct?

MR. GARREN: Object to form.

A It depends upon what your question is, what you are looking at. It can vary spatially and temporally, but if you look at -- it depends upon the scale of your analysis and what scale you are looking at. 01:05PM

Q And what was the scale of the Beaver Lake study? 01:06PM

A I believe we looked at all major tributaries here. So except some of the minor areas here on the top, it included all the major tributaries that are contributing flow to the Beaver Lake.

Q And from there, you make some general conclusions about what is seen across a watershed; is that -- 01:06PM

MR. GARREN: Object to form.

Q -- what this study says?

MR. GARREN: Object to form. 01:07PM

A I did -- I did not get your question completely. Can you clarify that, please?

Q I was interrupted. I'm sorry. And so the conclusions that you reach in this study are general in nature because they refer to processes across a large basin? 01:07PM

MR. GARREN: Object to form.

A That is correct.

Q And this is not a site specific survey -- study, Exhibit 6? 01:07PM

MR. GARREN: Object to form.

A Again, it depends upon how you look at it because lots of these studies are site specific studies. Why scientifically we try to do there is take general conclusions that could be applicable to 01:07PM

other watersheds and similar conditions, so that if this map become what limnologists call inorganic leaf litter degradation in a mirror stream, but try to under the general behavior that you can expect under similar conditions. 01:08PM

Q Right, but observing general behavior across a watershed doesn't tell you whether that behavior is going to actually happen at a particular site at a particular time even within that watershed?

A It tells you what you can expect in terms of 01:08PM the processes.

Q What may happen?

MR. GARREN: Object to form.

Q A general conclusion about behaviors across a watershed will give you -- is an opinion about what 01:08PM a particular -- a particular process that may happen at a specific site?

MR. GARREN: Object to form.

A Based upon what data has been collected, so what you have seen. So it's not all hypothetical, 01:09PM and it's not all out of line under -- you know, unless the conditions change so much that it's not the same study, you can expect that kind of behavior.

Q Assuming -- 01:09PM

A There will be the, you know, outliers. There will be variability in the data, but if you look at the general behavior of these basins, those general behaviors are applicable.

Q You said if the conditions do not change. 01:09PM
What conditions are you referring to?

A So I am -- for example, climate conditions, right. So suddenly the climate becomes completely different. You -- instead of getting 1,100 millimeter of precipitation, you only get 300 01:09PM millimeters or you get 2,000 millimeters. That will be entirely different condition. So then when you get a sudden change in the land use, the land management practices, unless those -- significantly different changes take place, the general 01:10PM conclusions would still be applicable.

Q So a change -- do I understand a change in land management could be one of those factors that might change the conditions underlying the general conclusions? 01:10PM

MR. GARREN: Object to form.

A Yes.

Q And you also see variability in the data as well; is that correct?

MR. GARREN: Object to form. 01:10PM

subject so you know where we are, please let me know. I want to go back for a minute. You offered some opinions about the transportation of bacteria from fields where poultry litter is applied. Do you recall those opinions? 01:20PM

A I do.

Q Okay. What -- what education do you have with regards to bacteria and the transport of bacteria in water?

MR. GARREN: Object to form. 01:20PM

A It's one of the non-point source pollutants I have looked at since my masters thesis. It was one of the constituents we looked at and quantified how effective buffer strips are, and since then in a number of other watershed scale studies, I have 01:20PM looked at bacteria.

Q Okay. How many papers would you say you've written that involve the transport of bacteria from poultry litter in runoff?

A At least two papers. 01:21PM

Q You indicated the one with regards to the buffer strips. What's the other that you recall?

A Both were related to buffer strips.

Q Okay. Can you give me the title of both of those documents -- of those articles? 01:21PM

A It was in '94, '95 published. I don't remember the titles, but if you look at my CV, they are there.

Q Okay. It's on a 1994 or 1995 publication?

A Both were in presentations of ASAE. 01:21PM

Q Okay. Can you tell me how long does the -- what types of bacteria are specifically identified in poultry litter?

A So the two that I have worked with and often used as indicator bacteria for properties of other types are E. coli and fecal coliform. 01:22PM

Q What do you mean about the life -- I want to say life span -- it may be an educated use of the term -- of E. coli within poultry litter that's been land applied? 01:22PM

MR. GARREN: Object to form.

A Can you be more specific in your question?

Q How long does the E. coli bacteria last in poultry litter when it's been land applied?

MR. GARREN: Object to form. 01:22PM

A I think it will depend upon the environmental conditions present.

Q Do you feel you have the expertise to offer opinions as to how long E. coli would last in poultry litter once it's been land applied? 01:23PM